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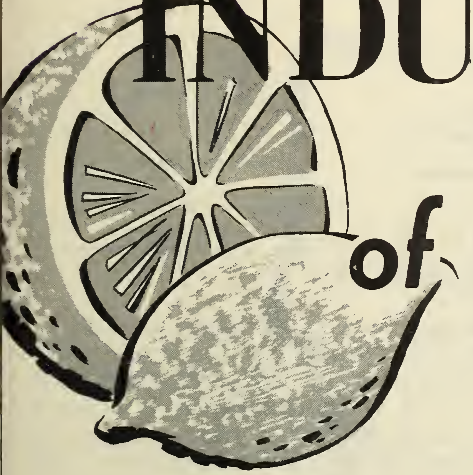
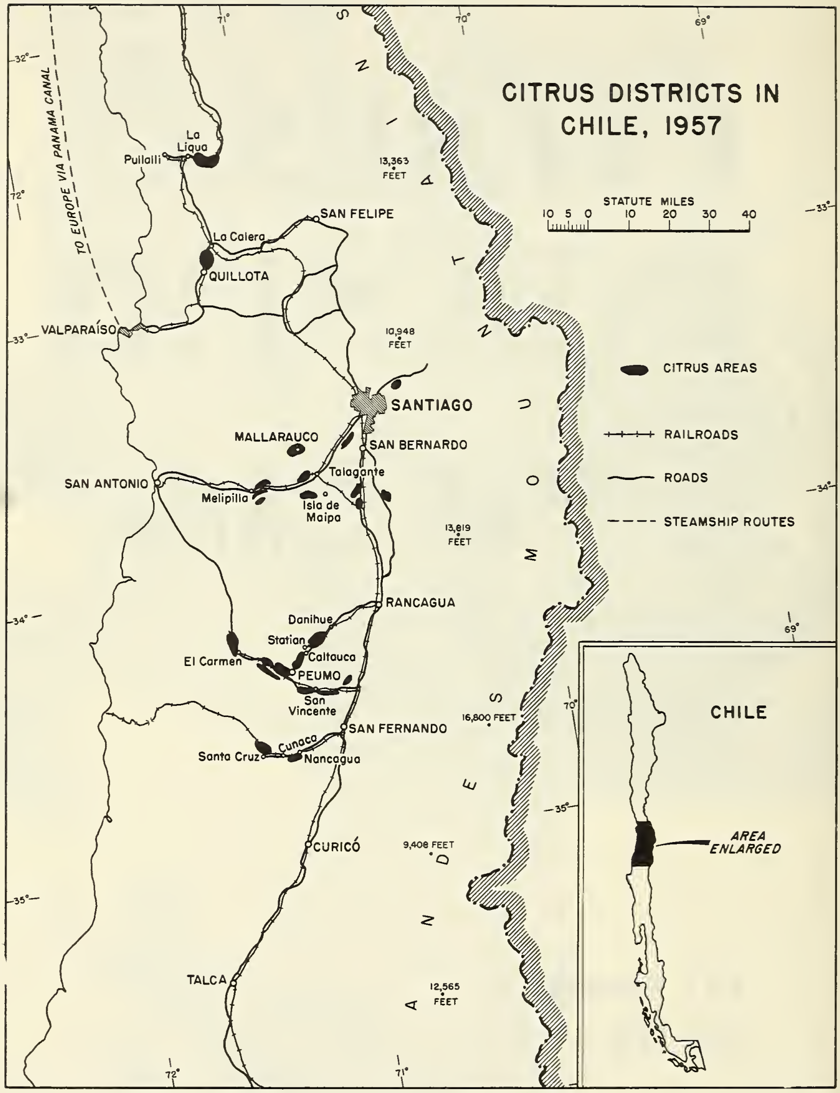
CITRUS INDUSTRY of Chile



By J. Henry Burke

June 1958

FOREIGN AGRICULTURAL SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE


CITRUS DISTRICTS IN CHILE, 1957
STATUTE MILES
10 5 0 10 20 30 40
CITRUS AREAS
RAILROADS
ROADS
STEAMSHIP ROUTES
TO EUROPE VIA PANAMA CANAL
La Ligua
Pullalli
13,363 FEET
SAN FELIPE
La Calera
QUILLOTA
VALPARAÍSO
10,948 FEET
SANTIAGO
MALLARAUCO
SAN BERNARDO
Talagante
SAN ANTONIO
Melipilla
Isla de Maipo
13,819 FEET
RANCAGUA
Donihue
Station
Coltauca
El Carmen
PEUMO
San Vincente
SAN FERNANDO
16,800 FEET
Cunaco
Santa Cruz
Nancagua
CURICÓ
9,408 FEET
TALCA
12,565 FEET
ANDES MOUNTAINS
CHILE
AREA ENLARGED
32°
33°
34°
35°
72°
71°
70°
69°

FOREWORD

This report is based on a survey made in Chile in 1957. It describes recent developments in that country's citrus industry and gives the outlook for fresh and processed products. It is one of the worldwide studies that the Foreign Agricultural Service has been making in competing agricultural areas, and is presented as an aid to the U.S. citrus industry in the development of world markets for fresh and processed citrus.

The report supplements "The Fruit Industry of Chile," by Fred A. Motz, published in 1942 by the Office of Foreign Agricultural Relations.

DM Rubel

D. M. Rubel, Director
Fruit and Vegetable Division

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CITRUS INDUSTRY OF CHILE

By J. Henry Burke
Marketing Specialist
Foreign Agricultural Service

SUMMARY AND CONCLUSIONS

Chile's citrus industry is small and probably will remain so. At present there are only a few new orange plantings, no new lemon plantings, and some of the lemon trees are past their production peak. Orange production can be expected to total about a million boxes by 1965--up from 1957's 825,000--while lemons will probably drop from 650,000 boxes to 500,000.

Two-thirds of the orange plantings are navel oranges. They are budded on rootstock which is susceptible to tristeza. An outbreak of this fast-spreading virus could be disastrous to orange production. Most lemons are a type called Genova, which compares favorably with U. S. lemons of California and which is not affected by tristeza. Expansion of both orange and lemon plantings is limited by the frost hazard and the late harvest season. The late season also limits export potential; Thomson navel oranges are not picked until late May, and export lemon picking does not begin before the middle of June.

Wages of citrus workers are low. The most important farm costs are materials and farm power. Cash costs of operating a lemon grove in 1957--estimated at $82 per acre--were comparatively low. Picking and packing costs were also reasonable. Break-even costs were $3.57 to $3.77 per box c.i.f. Hamburg.

Domestic marketing is not well organized. Most fruit is shipped in bulk from the groves and is not sized or graded. Per capita lemon consumption is relatively high--6.5 pounds--while orange consumption is very low--9 pounds. The domestic market, which is now oversupplied at times, will control the future of the industry.

Export marketing is a more carefully executed operation. Chile is a supplemental supplier of Europe's summer lemon market. The largest volume of exports is shipped when summer supplies of Mediterranean lemons are below normal. In years of normal supply in the Mediterranean, Chile's exports drop proportionately. Chile's marketing season in Europe is from late July to the end of September. Since World War II the volume of lemon exports has averaged about 75,000 boxes annually--about 80 percent to Germany. Most fruit is sold on consignment, and sound arrivals usually bring competitive prices. Some navel oranges may be shipped abroad experimentally, but the ordinary quality of the fruit makes it unsuitable for volume exports. Chilean grapefruit is not exported because it is of poorer quality than that produced in South Africa and cannot compete in European markets.

Chile is going through a period of inflation, and the free rate of the peso is above the official bank rate of exchange, making it possible for exporters to earn higher profits by "underinvoicing" exports. This practice has the effect of a subsidy.

Some processing is done in Chile. In Santiago there is a small processing plant which makes essential oil of orange and preserved natural strength navel orange juice for a soft drink bottler.

HISTORY

Chile has produced some citrus for over 200 years but commercial development is recent. In the period 1929-39 Chile's orange and lemon production was low, but small quantities of oranges were exported to Peru and small quantities of lemons to Europe. During this period Chile imported oranges from December to May. Imports never exceeded 40,000 boxes per year and originated in Brazil and Ecuador. Importing stopped about 1948.

Most commercial development has taken place since 1940. The war years 1940-46 were a time of expansion in citrus acreage. The 1954 frost damage was the turning point in the lemon industry. The recurrence of frost in 1955 discouraged some growers, and lemon acreage decreased as groves were removed, neglected, or top-worked to orange varieties.

PRODUCTION

Acreage

In 1955 the Chilean Department of Agriculture estimated that the country had 8,000 acres of lemons and about 10,500 acres of oranges. There has been little planting since this time and there are no indications that plantings will be extended in the future.

Limes, sweet lemons, and grapefruit are all minor crops.

Production

There are no official data on citrus production in Chile. Estimates given in table 1 are made from the best available sources. Orange production tripled between 1940 and 1956 and lemon production doubled during that period. Frost in 1954 and 1955 lowered production and damaged trees, but groves in 1957 recovered a normal bearing surface.

Only a small percentage of Chile's citrus production is in such well-tended groves as the carefully pruned navel orange grove pictured above or the excellent lemon grove near Puemo shown below.

TABLE 1.--Citrus: Estimated total production, by variety, Chile, 1940 and 1951-56

Year[1]	Oranges	Lemons
	1,000 boxes	*1,000 boxes*
1940	300	300
1951	900	725
1952	900	725
1953[2]	360	261
1954[2]	600	261
1955	750	450
1956	825	653

[1] Production given in year of bloom, October-November.
[2] Frost damage in June and July 1954 and 1955 reduced these crops.

Orange production may increase, and the 1965 crop may be expected to be about 1 million boxes. Lemon production will decrease since there are no new plantings and many groves have passed their peak production. If frost does not further reduce production, a 1965 lemon crop of about 500,000 boxes should be expected.

Should Tristeza attack orange groves, production could be drastically reduced and Chile then might again be an importer of oranges. Tristeza is a virus disease transmitted by aphids, which attack orange, tangerine, and grapefruit trees grown on sour orange rootstock. When it is introduced into an area, it spreads rapidly, killing trees grown on susceptible rootstock-scion combinations. The disease has destroyed large acreages of citrus in Brazil and Argentina. Tristeza does not affect lemon production.

Producing Areas

Citrus production in Chile is widely scattered, but most is within 100 miles of Santiago. The most important lemon and orange producing area is the Peumo-San Vicente Valley. Second most important are the scattered plantings south and west of Santiago, mostly near the road to San Antonio on the coast. Frostless areas of lemon production are located at Quillota and La Ligua, north of Valparaiso. All plantings are located in valleys where gravity water is available. West Indian limes are grown at Pica near the Peruvian border.

Cultural Practices

Chile's citrus areas are similar to California's. Most groves are planted on sandy loam soils. There is a wide difference in cultural practices between groves. Some groves are close, mixed plantings but most production comes from groves planted for tractor tillage.

The condition of most groves is not impressive; however, a few excellent commercial lemon and Valencia and navel orange groves were seen. First-class groves do not cover over 10 percent of the total acreage. Many lemon groves were declining and will go out of production in the next 10 years. Orange groves were generally in better condition than most lemon plantings.

Many groves are poorly cared for because of the recent frosts and low lemon prices. On the best-operated groves which produce most export fruit, trees are budded high on sour orange rootstock. Variations in fruit quality indicate that buds have not been selected carefully. There is no tristeza but gummosis is prevalent. All groves are irrigated by the furrow basin method with gravity water which usually has a salt content. Both orange and lemon trees are pruned. Lemon trees are thinned and orange trees are pruned high, about 4 feet from the ground.

The best cared-for groves are sprayed twice annually. One oil spray for California red, purple, and black scale, red spider, thrips, and aphids. In addition a skirt spray of copper sulfate is applied in the fall for gummosis. Some lemons are damaged by bud mite.

Winter cover crops are grown in some groves. Chile nitrate is the common fertilizer. Minor element deficiencies were noted in several groves.

Varieties

Following are Chilean words for the citrus varieties:
Naranjo (orange).
Mandarina (tangerine).
Limon (lemon).
Lima (sweet lemon).
Limon de pica (lime).
Pomelo (grapefruit).

About two-thirds of the orange plantings in 1957 were navel oranges. Nearly one-half of all oranges are Washington navels. Second in importance is a group of local seeded oranges called Tuncana, which cannot be tree-stored. They have about the same season as the Washington navel orange. The Thomson navel orange is third in importance; and only about 10 percent of citrus acreage is planted to Valencia oranges.

Lemon varieties are less well known. The Eureka lemon has been introduced from California, but as yet represents only a small part of total acreage. Most production is from a group of lemons known as Genova.

Little attention seems to have been given to bud selection. Upright growing trees have oval limbs with the narrow edge on top--similar to the Italian Femminello variety. Some of the fruit is similar to Italian varieties and some is characteristic of the Verna lemon of Spain. There is a lack of fruit uniformity which presents problems in grading for export.

Citrus Season

Chile has marked seasons; the climate is not tropical. Frosts are common in the Central Valley in winter.

The seasons are: Spring--September 21 to December 21; summer--December 21 to March 21; fall--March 21 to June 21; winter--June 21 to September 21.[1]

Oranges bloom in October and November. Thomson navel oranges may be harvested by late May. Both Valencia and Washington navel oranges are tree-stored. Washington navel oranges are harvested from July to September and Valencias from September to December. Some Valencias are picked even later. Some oranges are on the market every month in the year.

The navel oranges of June 1957 were highly colored but rather acid. Valencias are reported to attain only a yellow color and re-green by the end of the harvest season.

Lemons bloom in late September and October. This crop, comparable to U. S. winter lemons, is harvested in June, July, and August. Export lemons are not ready to pick before June 15. They are usually green or only breaking color at this time. Lemons have a second bloom, usually early in June which produces a summer lemon harvested in March and April. This crop is only about 25 percent of production, and, since harvest is about at Easter, it is known as Cuaresmero. Lemons have other minor blooms, and some fruit is harvested every month in the year.

Chile's orange season is later than that of some of its competitors--about 2 months later than the Transvaal in South Africa and about a month later than South Africa's Cape Province. Chile's lemon season is also at least a month later than the Transvaal in South Africa.

Frost Hazard

Frost is a major hazard to Chile's citrus industry. In June 1945 temperatures of 24°F. were recorded in citrus areas, and young lemon trees as well as lemons were frozen. In June and July 1954 minimum temperature dropped to 18° F., reducing the 1953[2] orange and lemon crops. The cold weather was the result of the mass movement of south polar air, and freezing temperatures lasted a week. This was the heaviest frost ever reported. Oranges and lemons were frozen and lemon trees defoliated. It took 2 years for the trees to recover from

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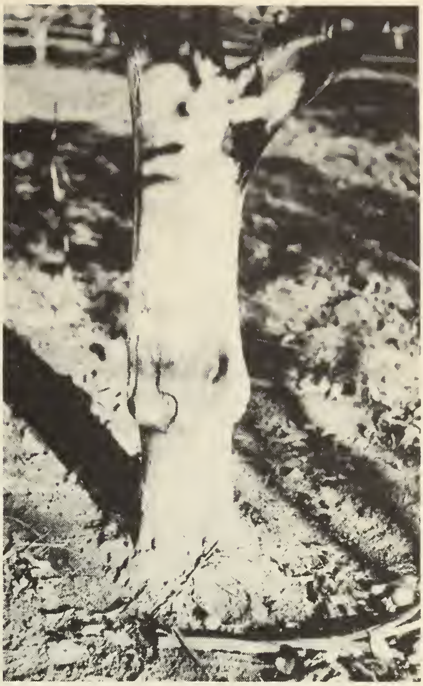
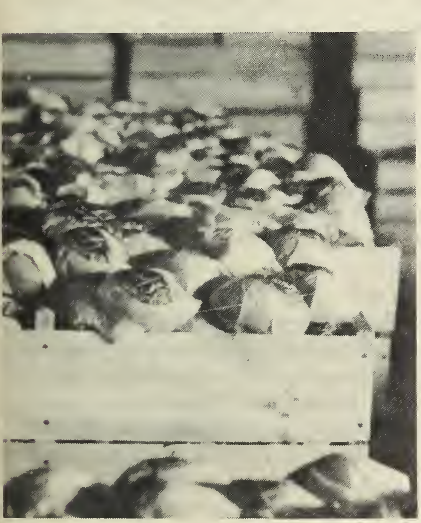
[1] South American Handbook 1956-57 p. 427, edited by Howell Davies. Trade and Travel Publication Ltd.

[2] Ibid.

Lemon trees in typical Chilean groves receive little care and may be expected to decline.



Bud union deformities on lemon trees are caused by incompatability of sour orange rootstock.



Export lemons are wrapped in diphenyl paper and packed in crates.

Packed lemons ready for export show the quality of the box shook.

the damage. In June and July 1955, frosts again damaged both lemon and orange fruits reducing 1954[3] production. In late June 1957 there was frost damage to lemon trees in a marginal producing area. Frost damage to oranges may be more common than is generally known. Dry oranges late in the season (an indication of frost damage) are a consumer complaint.

COSTS

Wages [4]

Workers' salaries are increasing because of inflation. In the Santiago area the minimum wage of "white collar" workers ranged from $38.00 to $44.00 per month in 1956 and $49.00 to $58.00 per month in 1957. This was the total wage paid to these workers; they get no other benefits or services.

Farm workers are in a different situation. They are furnished a house and about an acre of land, part of which is usually irrigated. They also receive some produce from the farm. In the Santiago area in 1956 the minimum daily wage of farm workers ranged from 38 to 51 cents per day. In 1957, they had increased to 50 to 66 cents.

By law, only 25 percent of the wages of farm workers has to be paid in cash. The rest may be paid in produce. Thus, the farm worker receives very little cash. He works mostly for his housing and sustenance.

Operational Costs

The most important cost items are materials and farm power. In cultivation, the major cost is the operation, depreciation, and repair of the tractor. In spraying, the material cost is most important, operation of the sprayer second, labor costs the least important. The only cost for irrigation water is the upkeep of dams and ditches to bring it to the grove. Taxes on land are low; the estimate of $2.00 per acre per year is generous.

Irrigated land suitable for citrus in the Rengo and Peumo districts was priced at $400 to $700 per acre in 1957. Bearing citrus groves in these districts were priced at $1,200 to $1,700 per acre.

In estimating the cash cost of producing lemons (table 2), known cultural practices have been used as a guide and labor costs have been estimated at the rate of 603 pesos per day to cover social benefits earned, produce, and facilities received as a part of wages. In addition, an allowance has been made for depreciation on housing. Costs have been estimated generously.

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[3] Production is given in the year of bloom.

[4] All monetary values converted at 603 pesos to the dollar.

TABLE 2.--Chile: Estimated annual cash cost of operating a lemon grove, 1957

Item	Cost per acre	
	Pesos	*U.S. dollars*[1]
Cultivation - 4 times 8 hours-tractor and operator......	7,230	12
Fertilization - 400 pounds of Chile nitrate $60.00 per ton...	7,230	12
Spraying - 1 oil spray, 1 skirt spray with copper sulphate	12,060	20
Pruning - 8 days....................	7,230	12
Irrigation: 6 times a year		
Water cost; dam and ditch repair..	1,809	3
Application, labor................	3,618	6
Miscellaneous - Housing Depreciation on trucks, tractors, tools, and other expenses.........	9,045	15
Taxes on land......................	1,206	2
Total..........................	49,428	82

[1] Converted at 603 pesos per dollar.

The estimated cash cost of operating an acre of lemons in 1957 was about $82. This represents costs on the best-operated groves, which produce most export fruit, but probably not over a third of total lemon production.

The actual average yield of lemons on two estates over a 4-year period ranged from 140 to 210 boxes per acre per year. The cultural cost of producing export lemons ranged between 38 and 58 cents per box, as shown in table 3.

Break-even Costs

Break-even costs for Chilean lemons, c.i.f. Hamburg in 1957 are estimated in table 3. These ranged from $3.57 to $3.77 per box using ventilated stowage and from $4.10 to $4.30 per box using refrigerated stowage.

Export Costs

Picking and packing is a major cost of export. The 1957 cost of the box, paper wraps, and nails and straps was higher than the average cost of producing lemons. Packers are paid about 58 cents per day. They are given lunch, which together with social benefits increases the wage cost to about $1.66 per day. The labor cost of packing is low.

Total costs from tree to port in 1957 were estimated at $1.72 per box. These include picking, packing, and shipping to port, including port costs.

TABLE 3.--Lemons: Estimated cash cost of production in Chile and marketing in Hamburg per export box, 1957

Item	Cost per box	
	Pesos	*U.S. dollars*[1]
Picking	80	0.13
Box	200	.33
Paper wraps	190	.31
Packing	270	[2] .45
Nails and straps	30	.05
Total, picking and packing	770	1.27
Transport to port	120	.20
Port costs	150	.25
Cash cultural costs	234-353	.38-.58
Total cost f.o.b. Chile	1,274-1,393	[3] 2.10-2.30
Sea freight to Hamburg and the United Kingdom:		
Ventilated stowage	---	1.47
Refrigerated stowage[4]	---	2.00
Total break-even costs c.i.f. Hamburg and the United Kingdom:		
Ventilated stowage	---	3.57-3.77
Refrigerated stowage	---	4.10-4.30

[1] Converted at 603 pesos to the dollar.

[2] Mostly packing house charges. Field packing costs only 20 cents per box.

[3] $1.69-$1.86 if converted at the June 1957 free rate of exchange 750 pesos to the dollar.

[4] The rate to Scandinavia was $1.68 per box ventilated stowage and $2.24 per box refrigerated stowage.

MARKETING

Domestic marketing of citrus in Chile is unorganized. Citrus for the domestic market is not graded, washed, or packed. There is no control on the quality of fruit sold. Both lemons and oranges are brought to market by truck, often in bulk, as orchard-run fruit. Wholesalers usually buy from growers at the orchard. Most fruit is sold through weekly retail markets and by street vendors.

In 1954 and 1955, frozen oranges were sold. This frozen fruit has hurt the orange market. In June 1957, immature wind-fall Washington navel oranges were being sold mixed with the more mature Thomson navels. The consumer has no protection in Chile's orange market. The display of oranges in Chile's retail shops was poor.

Both orange and lemon prices are lowest in the winter--June to September. The wholesale prices of Thomson navel oranges was about $1.84 per box in June 1957. The wholesale price will at least double in the summer--December and January. Trade sources indicate that growers average about $1.40 per 70-pound box for orchard-run fruit sold for domestic use. The quality of summer fruit tends to be poor since some is tree-stored beyond its normal commercial life. Lemons for the domestic market cost $0.86 to $1.14 per box at the grove and were retailing for $2.00 to $2.86 per box in June 1957.

Domestic Consumption

In 1957, Chile's 6.5 million people, who are mostly in the valley around Santiago, consumed an estimated 6.5 pounds of lemons per capita. This is a higher per capita consumption of fresh lemons than that of the United States. Lemons are widely used with fish, steak, and as a garnish on many dishes. They are also used in Chile's homes as a food and as a cleanser. And they are an important ingredient in a popular drink.

The estimated average consumption of oranges in 1957 was about 9 pounds per person. This is one of the lowest consuming levels of any commercial orange producing area in the world.

The consumption of lemons is not likely to increase, but there is ample opportunity to expand orange consumption.

Picking and Packing for Export

All lemons are clip-picked for export. Only export-quality fruit is selected when picking for export. Only two or three pickings of export fruit may be made. A tree will not produce over three boxes of export fruit per year. The rest of the crop is sold in the domestic market. After picking the fruit is stored for a few days in field boxes to cure before packing. Most fruit is washed with a fungicide, graded, and sized in modern plants. Export fruit is wrapped in imported diphenyl-treated paper and packed in a wooden two-compartment box which weighs 73 to 79 pounds gross. Both sight and mechanical sizing are used. Lemons are not waxed.

The export box shook is made in Chile from pine. It is of rather poor quality, and many broken boards can be found on packed boxes. A steel strap is placed around the middle of the box and wire, at each end.

Some fruit is field-packed. This fruit is stored 4 or 5 days, sight-sized, and graded. One exporter, field-packing lemons, was having the fruit wiped by hand with a cloth dampened with a fungicide.

Exports

Chile's citrus export trade has been confined to lemons. Since 1948, lemon exports to Western Europe have averaged about 75,000 boxes per year. The highest exports were in 1953 (table 4). Frost damage in 1954 and 1955 reduced production and exports. The export of frozen lemons in 1954 is reported to have hurt the reputation of Chile's lemons in European markets. Over 80 percent of total exports since 1948 have gone to Germany.

TABLE 4.--Lemons: Total exports from Chile, 1948-56 and by country of destination 1953-56

Year	Total exports	Country of destination	1953	1954	1955	1956
	1,000 boxes		*1,000 boxes*	*1,000 boxes*	*1,000 boxes*	*1,000 boxes*
1948..	32	Belgium...........	3	---	---	---
1949..	---	Denmark...........	4	---	---	---
1950..	72	France............	23	---	---	---
1951..	29	Germany...........	109	57	64	34
1952..	80	Netherlands.......	4	---	---	---
1953..	146	Peru..............	(1)	---	---	---
1954..	60	Sweden............	1	2	---	1
1955..	80	United Kingdom....	2	1	16	(1)
1956..	35					
		Total..........	146	60	80	35

[1] Less than 500 boxes.

The Government of Chile controls the quantity of fruit which may be exported in order to protect the domestic market. In June 1957 about 116,000 boxes were authorized for export. Total 1957 lemon exports probably ranged from 100,000 to 150,000 boxes.

In the future lemon exports may be expected to follow the same pattern as in the past. There are no indications that they could exceed 200,000 boxes per year and will probably average about 75,000 boxes in most years. Small quantities of navel oranges may be exported, but total volume is not likely to exceed 50,000 boxes per year.

Export Season

Chile's lemon export season is from June 20 to Sept. 1, making lemons available in Western European markets from July 20 to Oct. 1. Should navel oranges be exported in the future they would also follow this seasonal pattern.

This is a short export season. In some years export lemon picking begins in late May, but not over 5 percent of the export lemon crop can be harvested before June 15. In 1957 the first export lemons were not picked until after June 15. A typical monthly lemon harvest is illustrated in table 5.

TABLE 5.--Lemons: Harvest by month and sizes packed for export by one producer-exporter, Chile, 1956

Month	Total lemon harvest	Export lemons packed[1]	
	Boxes	*Size*	*Boxes*
January	1,247	240	1,020
February	1,798	252	---
March	551	270	782
April	406	300	1,144
May	1,102	330	1,149
June	2,610	360	826
July	9,280		
August	5,046	Total	4,923
September	2,349		
October	7,975		
November	8,584		
December	2,900		
Total	43,848		

[1] June 21-July 27, 1956.

The inability to pick export lemons in volume before June 15 is a major limitation on Chile's lemon export potential. The size of the lemon industry will be determined by how profitable the domestic market--the major outlet--is.

Government Inspection

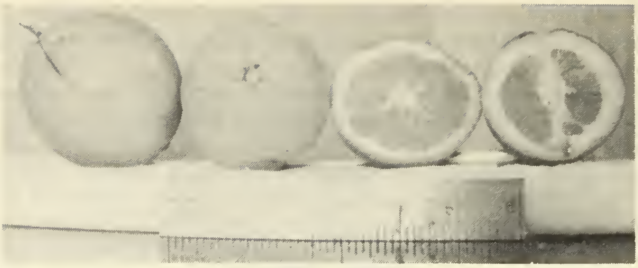
Chile has regulations for the export of fruit. All exports are inspected by the government at the port before shipment.

Size of Export Lemons

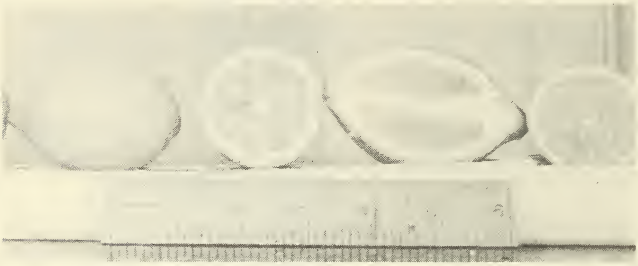
The size of lemons exported is controlled by the selection of fruit. Chile's lemons tend to be large, and orchard-run sizes probably peak at about size 200. The size of fruit exported by one firm in 1956 is shown in table 5.

Method of Sale

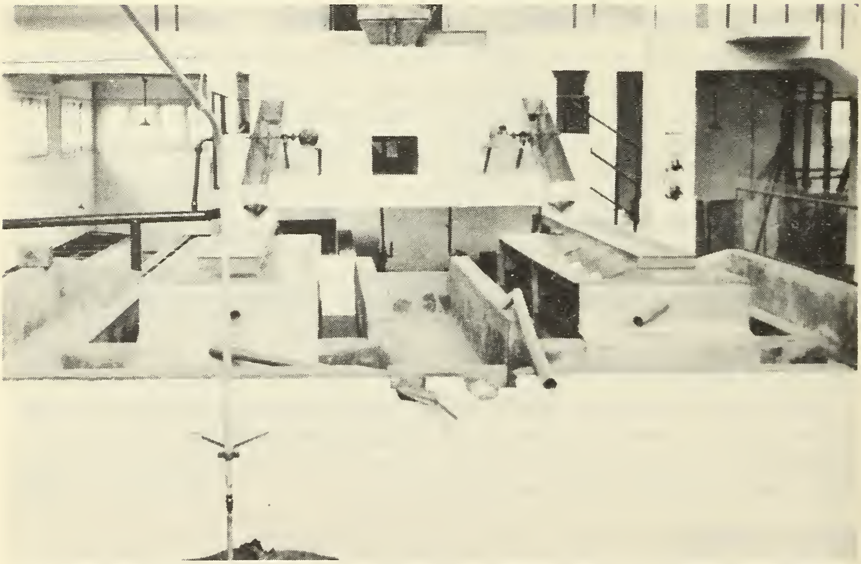
Most lemons exported to Europe are sold on consignment. In 1957, exporters received an advance from European



Thomson navel oranges average 12 seedless sections, with little juice or flavor. Other traits are good color, smooth peel, and stem-end creases.



Genova lemons average 8-10 sections and 5-6 seeds. They are thick-peeled and acid. Thin-peeled fruit at right was cured about 10 days.



Chilean processing plant has vertically mounted hand juice extractors. All juice is sold for use by the soft drink industry.

purchasers of about $2.00 per box when the lemons were loaded at a Chilean port. The balance was paid by the importers when they sold the fruit.

In 1957, too, the commission charged by German firms for the sale of lemons was reported by trade sources as a 3 percent of the gross sales price for the auction of large lots and 7 percent of the gross price for small lot auction and private sales.

The largest exporter is a citrus association which handles export sales for its members' accounts.

Growers who are not members of the citrus association sell directly to exporters. In such transactions the grower picks the fruit and the exporter does the packing. In June 1957, exporters were reported to be paying about $2.10[5] per box at the grove for lemons picked selectively for export. Only export sizes and quality are picked and only about a box of export fruit per tree is obtained from each picking. At this price the f.o.b. cost of lemons was about $3.82 per packed box, or about $5.29 to $5.82 per box c.i.f. Europe depending on the type of stowage used.

In June 1957 German importers were reported to be offering $3.00 to $4.00 per packed box for lemons f.o.b. Chile.

Market Acceptance

Lemons from Chile have good market acceptance and are competitive in European markets. The fruit cures in the long trip in ventilated stowage and has an appearance similar to California lemons. Chilean lemons are much more like California fruit than are their competitors, the Italian Verdelli lemons.

Lots arriving in sound condition have sold well. An illustration of this is the auction at Hamburg on July 24, 1956, (table 6). On this day, Chilean lemons sold at prices comparable to those from both Italy and California. All sales are not this favorable to Chile, but it serves to illustrate that lemons from Chile can be a very acceptable product.

Sea Transport

Citrus exports are made through the port of Valparaiso. Cold storage facilities are available there. But port facilities are limited, so most ships are loaded from lighters. Export lemons are often trucked to port and unloaded directly into lighters.

Several steamship lines have regular service between Chile and Europe. The trip from Valparaiso to Europe through the Panama Canal usually takes about 32 to 34 days. The ships in regular service have a combined refrigerated capacity of about 75,000 boxes of citrus per month. Ventilated stowage is available for a much larger quantity of fruit, but

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[5] Converted at 603 pesos to the dollar.

TABLE 6.--Lemons: Comparison of auction prices, Chile, California, and Italy, by size, Hamburg, July 24, 1956

Size	Chile[1]	California[2]	Italy[3]
	U.S. dollars per box	*U.S. dollars per box*	*U.S. dollars per box*
210.........	6.49 - 6.55	---	---
240.........	6.49 - 6.55	---	---
252.........	---	4.52 - 5.95	---
270.........	6.90 - 7.02	---	---
300.........	6.96 - 7.08	4.40 - 7.02	6.43 - 7.14
330.........	5.95 - 6.37	---	---
360.........	5.95 - 6.05	4.76 - 6.55	5.24 - 6.49
390.........	5.95	---	---
420.........	6.49	---	---
432.........	---	5.00 - 6.67	---

[1] 73-79 pound box.
[2] Two half-box cartons, equal to 73-79 pound box.
[3] 79-99 pound box.

only a part of it has modern forced draft equipment. Most lemons however, have been shipped satisfactorily in ventilated stowage, although some exporters will only ship under refrigeration. All sea freight from Chile to the United States and Europe is paid in U.S. dollars.

Adequate space is available on ships in regular service to accommodate the quantity of lemons Chile is likely to export in the future. If Chile should become an exporter of navel oranges, they will have to be shipped under refrigeration. Even a small export of 50,000 boxes would probably make existing refrigerated space inadequate for both oranges and lemons.

Inflation

Chile is going through a period of currency inflation which affects its position in foreign trade.

There are two rates of exchange. The Central Bank rate is used for the purchase of dollars for sea freight. This is also the rate at which imports are paid and earnings from exports exchanged. In addition, there is a free, or brokerage, rate of exchange. This is the rate at which dollars may be bought or sold for nontrading transactions. This free market is small. The total monthly volume is only $3 million to $4 million.

In 1954 the bank rate was about 200 pesos to the dollar but there were different rates for different commodities. The free rate ranged from about 250 to 350 pesos to the dollar.

In 1955 the multiple bank rate was continued but the average trading rate was about 300 pesos to the dollar. The free rate fluctuated widely ranging from 300 to 800 pesos to the dollar.

The Central Bank adopted a single rate for all commodities in April 1956. The rate was set at about 500 pesos to the dollar and remained stable until October. The free rate ranged from 500 to over 600 pesos to the dollar in 1956.

By June 1957 the bank rate was 603 pesos to the dollar and the free rate in the first half of 1957 ranged from 600 to 765 pesos to the dollar.

There were no indications in 1957 that stability of foreign exchange rates had been achieved.

Exchange Problems

An exporter of lemons must obtain an export permit which entitles him to purchase dollars for the sea freight at the bank rate of exchange, 603 pesos plus a tax of 45 pesos per dollar (about 648 pesos per dollar in June 1957). When the exporter sells lemons he must also convert his foreign exchange at the bank rate, 603 pesos to the dollar in late June 1957.

He was thus paying about 650 pesos per dollar for the sea freight cost and receiving only about 600 pesos per dollar on his lemon sales. The free rate of exchange at the time was 765 pesos to the dollar.

The wide spread between the bank rate and the free rate of exchange makes it tempting for exporters to manipulate their foreign exchange earnings. If an exporter of lemons sells them for $6.50 per box in Europe and, by agreement with the buyer, receives official payment of $5.50 per box he has earned $1.00 per box to sell at the free rate of exchange.

In such a transaction in late June of 1957 he would receive about 3,920 pesos for a sale of lemons at $6.50 per box if the entire sale price was reported and converted at the bank rate of 603 pesos per dollar. If, however, he reported only $5.50 per box by "underinvoicing" and sold the extra dollar in the free market at 765 pesos to the dollar he would receive about 4,082 pesos for his sale. The greater the amount of the "underinvoicing" the greater the difference will be.

Trade sources indicate that this practice is followed at times.

Processing

There is one processing plant in Chile. It is located in Santiago and is operated by the Citrus Growers Association. Export lemon packing facilities are also located at the processing plant.

The orange processing season is from June to September. The plant has a capacity of 4,500 to 5,500 short tons of oranges per year. It produces about 40,000 to 50,000 U.S. gallons of single strength preserved juice for a soft drink bottler. Essential oil of orange is also produced.

The plant is a simple operation. Fruit is brought from the field in trucks, sometimes in bulk. In processing, the fruit is washed and passed through a continuous oil extractor of Italian manufacture. The essential oil is carried from the extractor and mixed with water. This mixture is kept several days in concrete tanks, where the oil is separated from the water by flotation. To complete the separation a centrifuge is used. Only cold pressed oil is produced. Oil is stored at the plant in glass containers in a cool dark cellar. The orange oil is clear and has good aroma.

After the oil has been extracted, the fruit is mechanically sliced and the juice is extracted on 24 vertically mounted hand reamers. The extractors stand over stainless-steel trays which collect the juice, and are of different sizes; the operator selects the proper size to use. Seeds are removed by a screen, and the juice is pumped into mixing tanks, where about 220 pounds of sugar and 0.9 gallon of benzoate of soda are added to each 159 gallons of juice. Sugar is added both as a preservative and to maintain a constant sugar-acid ratio. After mixing, the juice is put in sealed casks, where it is stored until used by a soft drink bottler. The waste peel is taken to an adjacent building, placed on wooden trays, and dehydrated in equipment used for prunes. The dry peel is sold as cattle feed.

A small laboratory is operated and all fruit is tested as it is received. These tests are used to maintain uniform quality in the finished juice.

The orange juice has good color. The average yield of juice is reported to be 35.5 percent by weight. In June, navel oranges may test as high as 3 to 4 percent citric acid. In July, navel oranges test about 1.5 percent citric acid and 10.5 degrees Brix and have a sugar-acid ratio of 6.5 to 1. By August, average tests are reported as 0.8 percent citric acid and 8.9 degrees Brix and the sugar-acid ratio is 10 to 1.

Lemons are reported to yield 34 to 40 percent juice by weight. In July, they test about 4.6 percent citric acid and 10.2 degrees Brix and have a sugar-acid ratio of 2 to 1. By August, they test 4.8 percent citric acid and 9.4 degrees Brix and have a sugar-acid ratio of 1.85 to 1.

Both oranges and lemons are stored 24 hours before processing, to increase the yield of essential oil. Average yields of essential oil for both oranges and lemons is reported to be only 2.6 to 3.3 pounds per ton of fruit.

The government checks the plant periodically to make certain that sanitary conditions are maintained.

Juice and essential oil are sold to soft drink bottlers in Chile. When processing was started, some orange oil was exported to Argentina, but trade has stopped because of increased domestic consumption.

Chile has no potential for producing processed products for export. Navel oranges, which have a high acid content, are the primary variety used for processing. The quantity of lemons used in processing is small and no supply of fruit exists to markedly increase lemon processing. There is little demand for lemon juice in Chile.

No U.S. canned citrus juices are available in Santiago stores.

Outlook

Chile's lemon industry will remain small.

Increased lemon production should not be expected. The domestic market is saturated and could not easily absorb any substantial increase in production.

The type of fruit, the late harvest season, and the possibility of frost limit lemon export opportunities. Not more than a third of the crop is of export quality. An improvement in fruit uniformity is not likely to be obtained under present economic conditions. World prices would not make growing lemons for processing profitable.

The orange industry might increase in the future, but only for the domestic market. The export of navel oranges from Chile is not likely to be successful because of the ordinary quality of the fruit.

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